

# HIGH THROUGHPUT IN SITU IMAGING REVEALS COMPLEX ECOLOGICAL BEHAVIOUR OF GIANT MIXOTROPHIC PROTISTS

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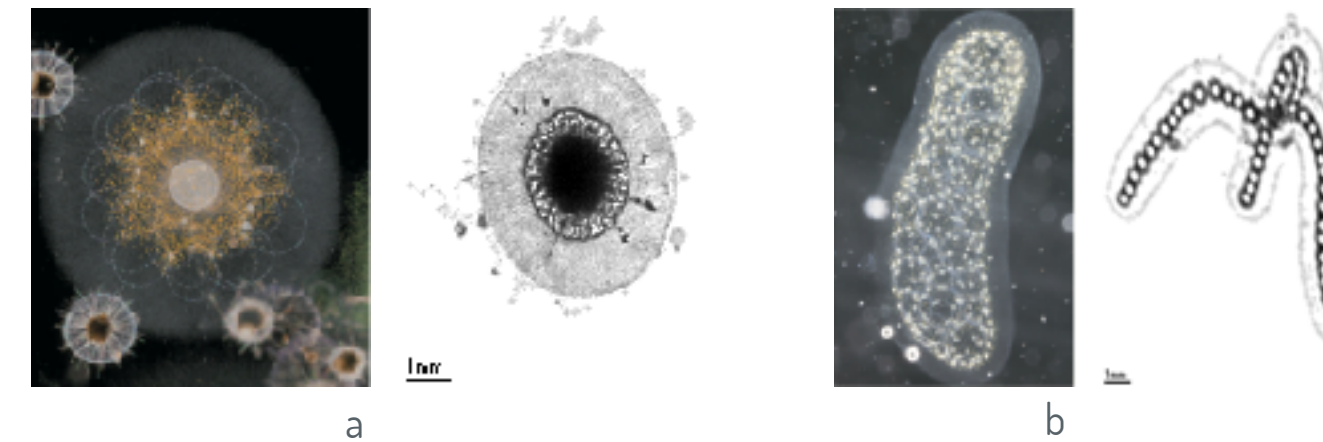
Computational Plankton Ecology (COMPLEx team)  
Laboratoire d'Océanographie de Villefranche



## RHIZARIA

- Unicellular eukaryotes
- Poor knowledge of their ecology
- Mixotrophic VS non mixotrophic
  - Fine-scale distribution and relation to the environment
  - Acquisition of symbionts (no vertical transmission)

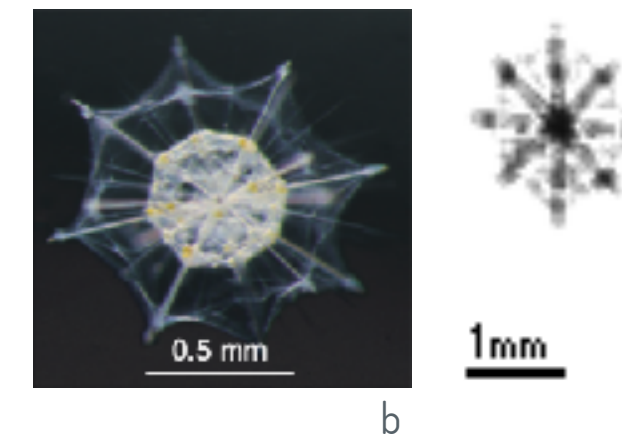
Collodaria



- solitary or colonial
- mixotrophic
- no shell

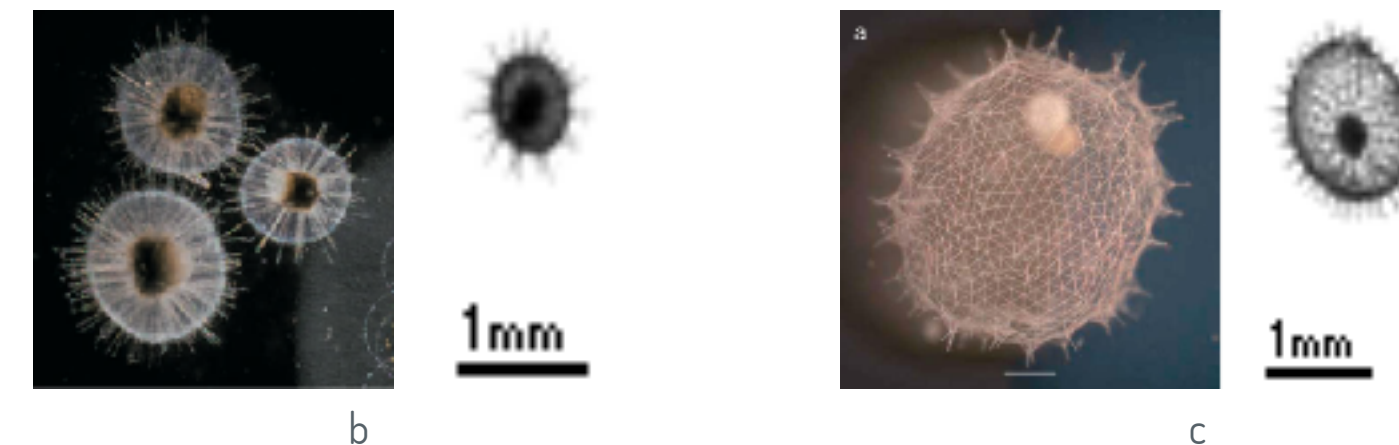
<sup>a</sup> Sardet 2015  
<sup>b</sup> Biard and Ohman 2020  
<sup>c</sup> Biard et al, 2018

Acantharia



- solitary
- mixotrophic
- strontium sulphate skeleton

Phaeodaria



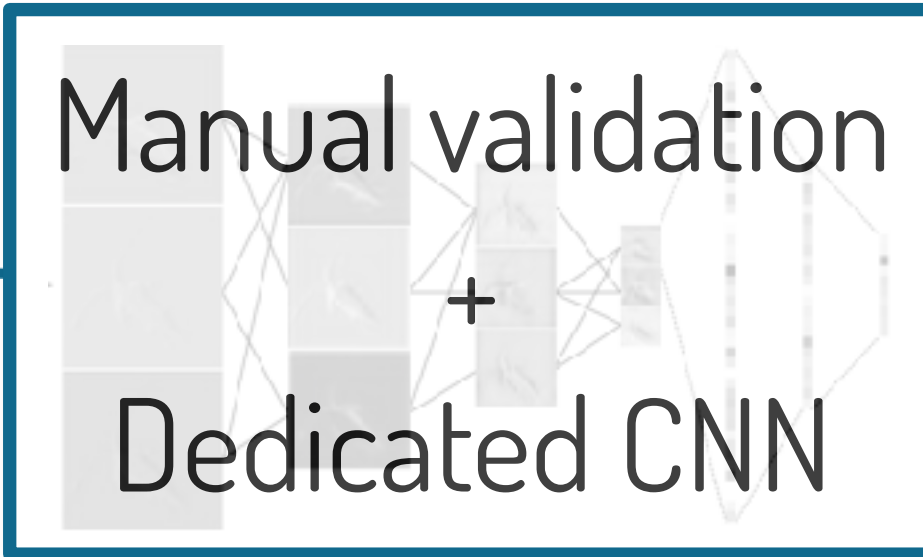
- solitary
- heterotrophic
- siliceous skeleton

# DOES TROPHIC ECOLOGY AFFECT THE FINE-SCALE DISTRIBUTION OF RHIZARIA?

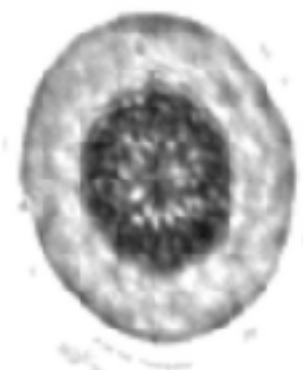
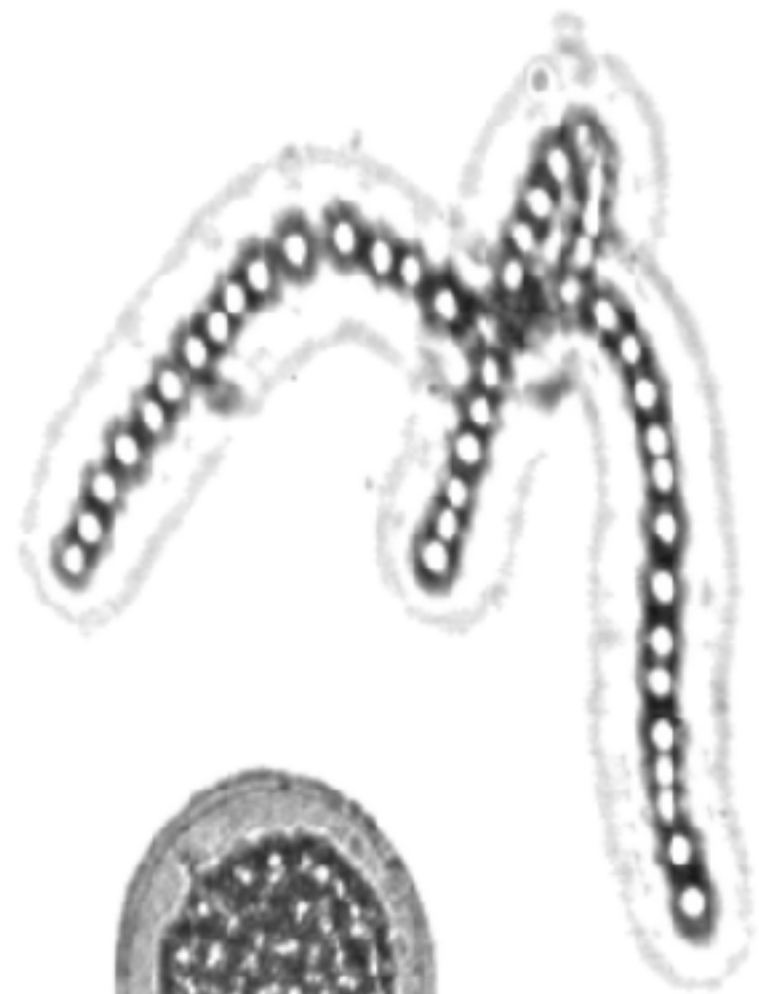


# DATASET COMPOSITION

8 M planktonic organisms



230,000 Rhizaria  
in 14 subgroups  
3 large groups



1 mm

Collodaria (colonial)

Collodaria (solitary)



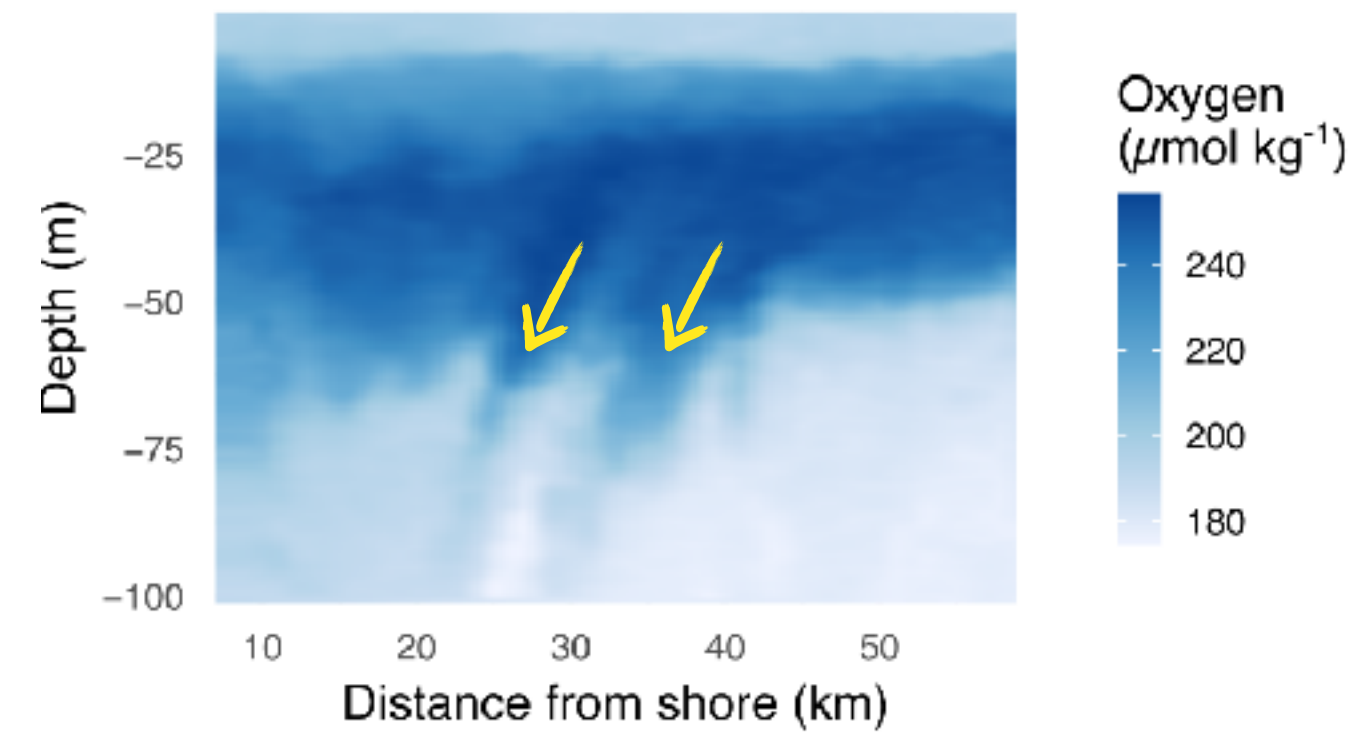
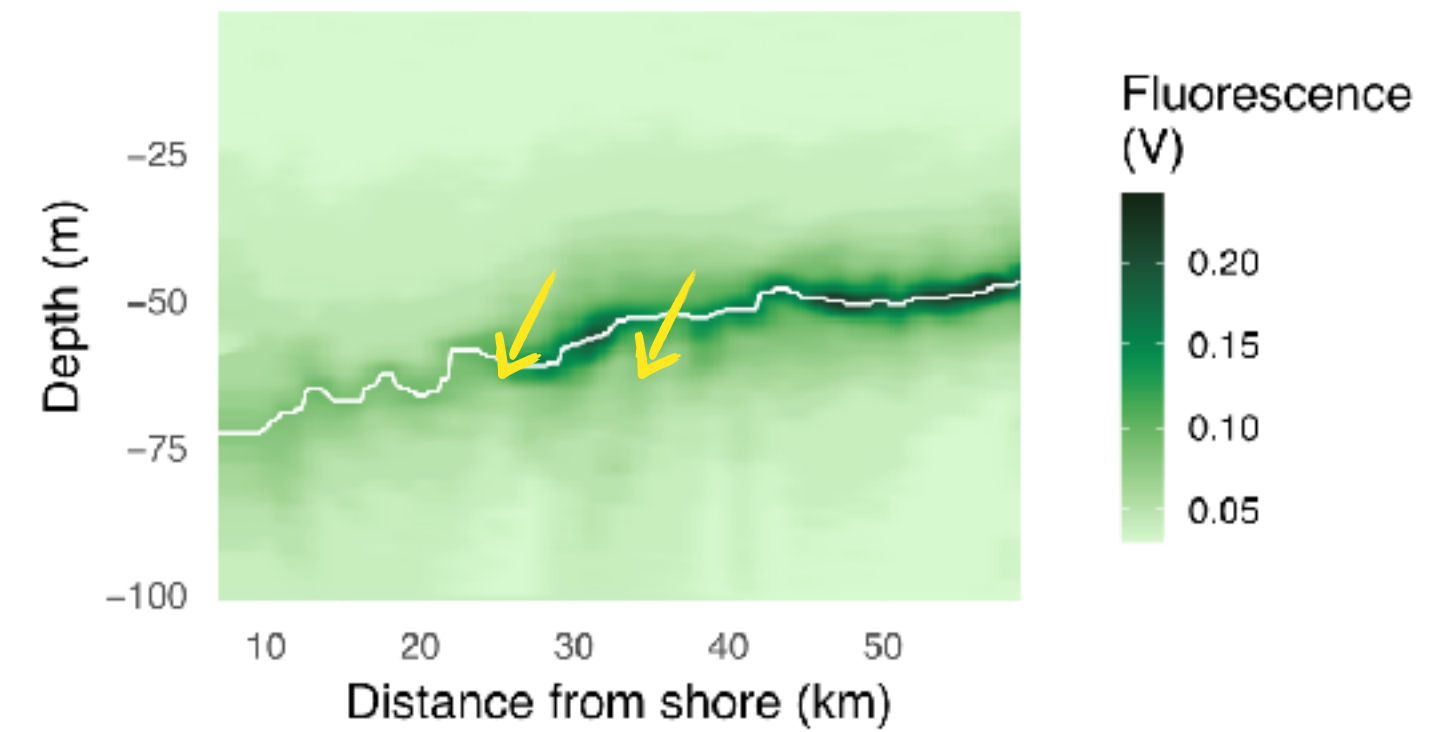
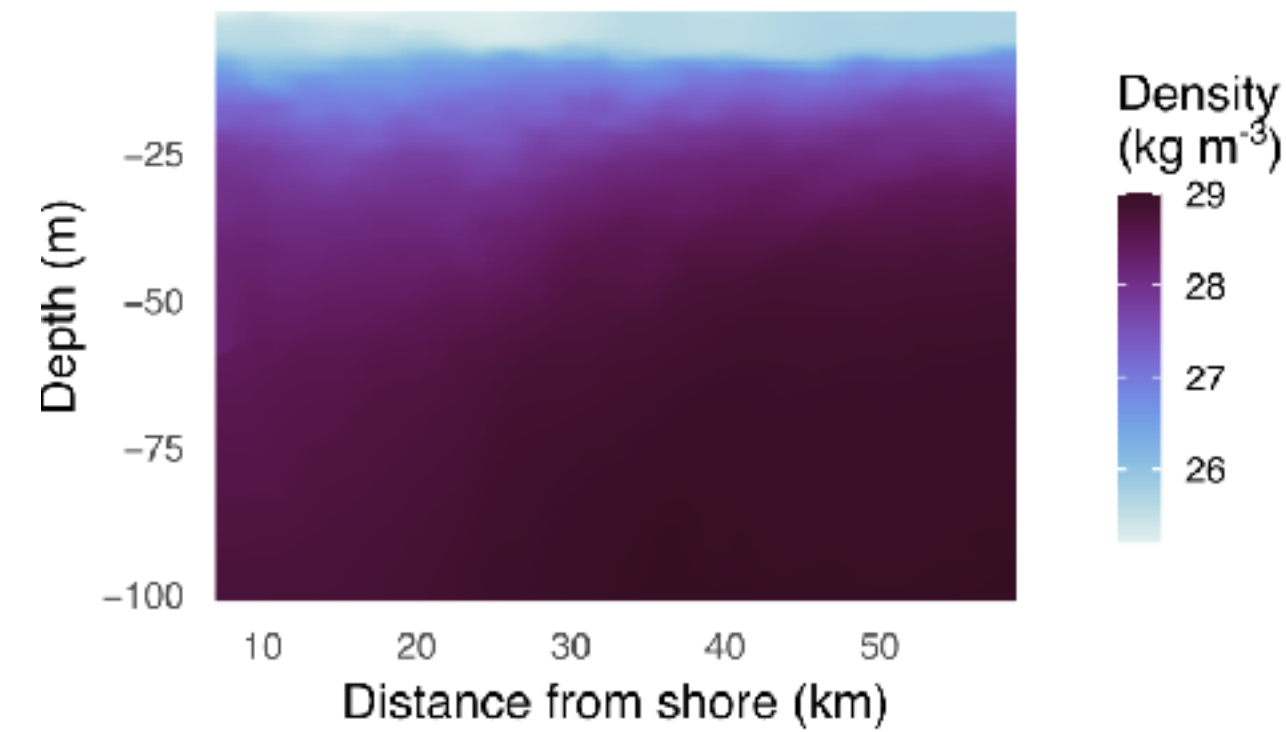
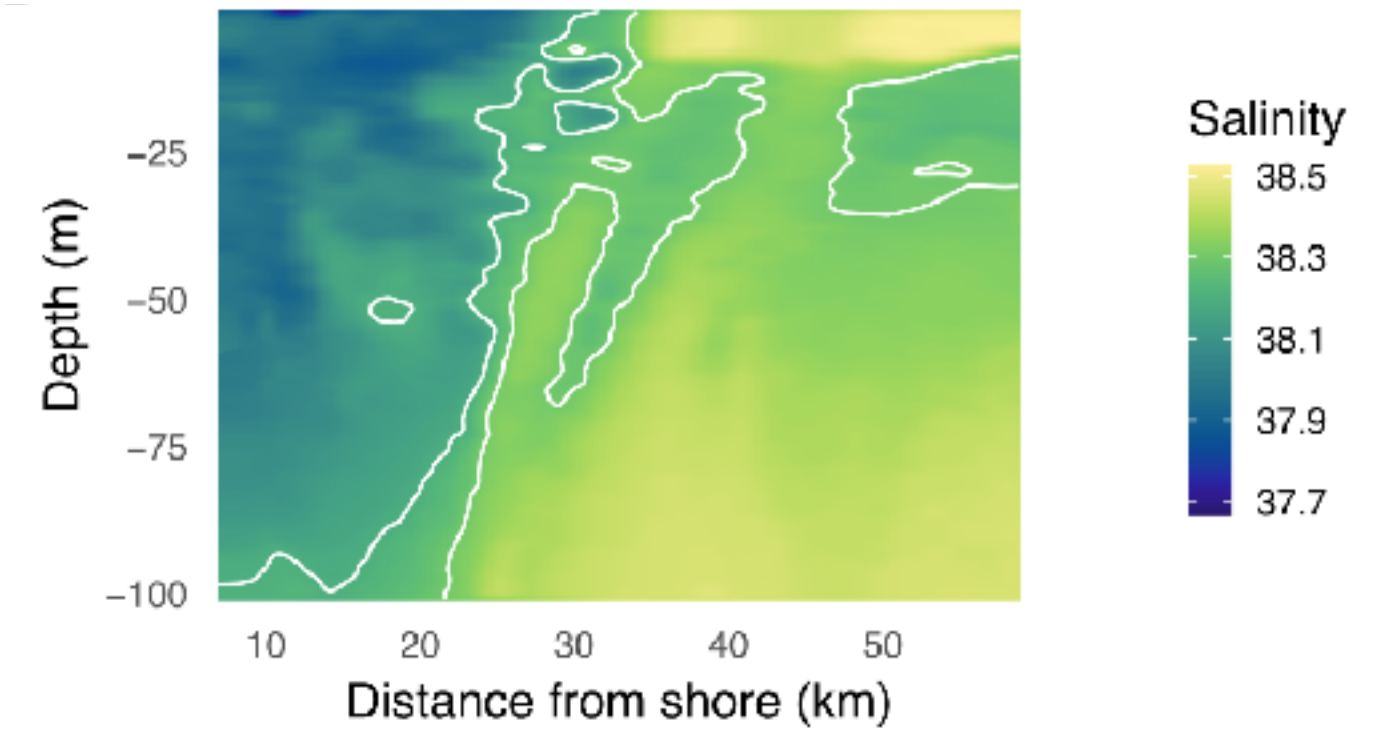
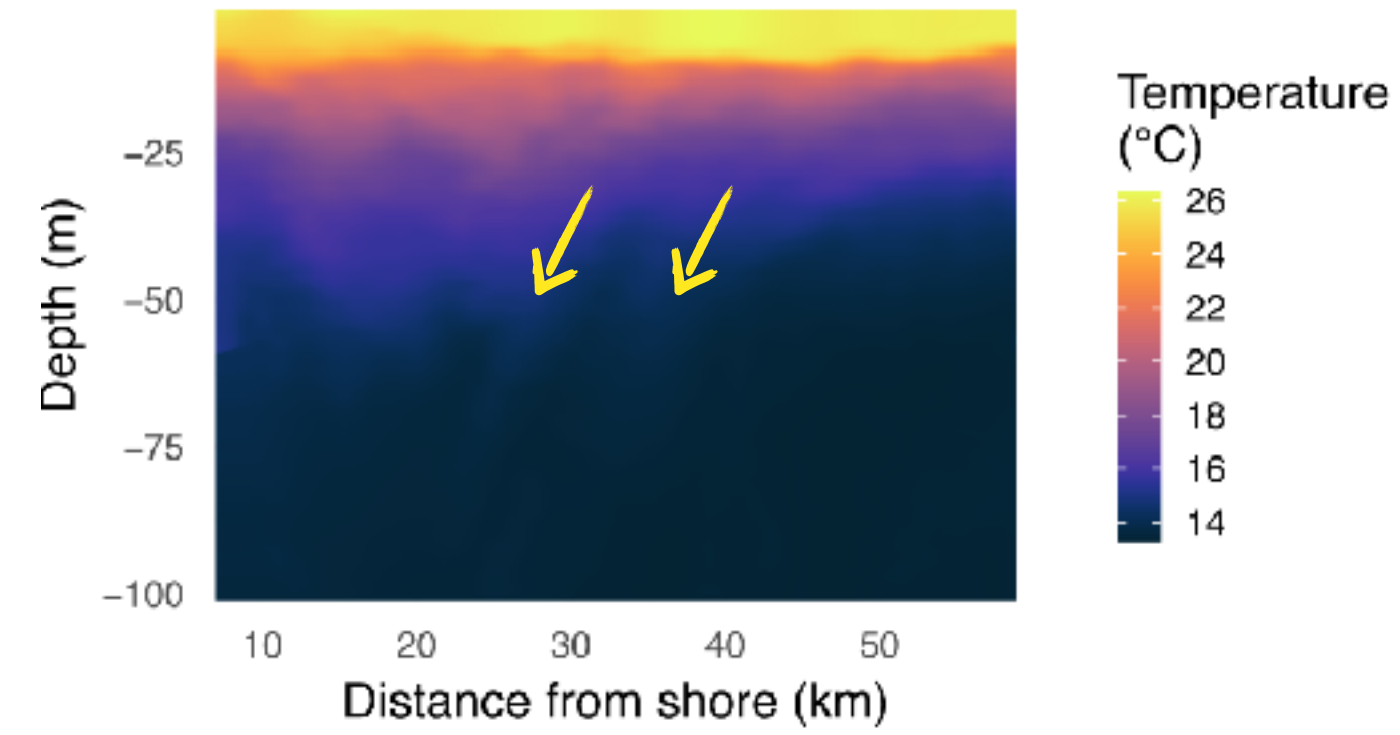
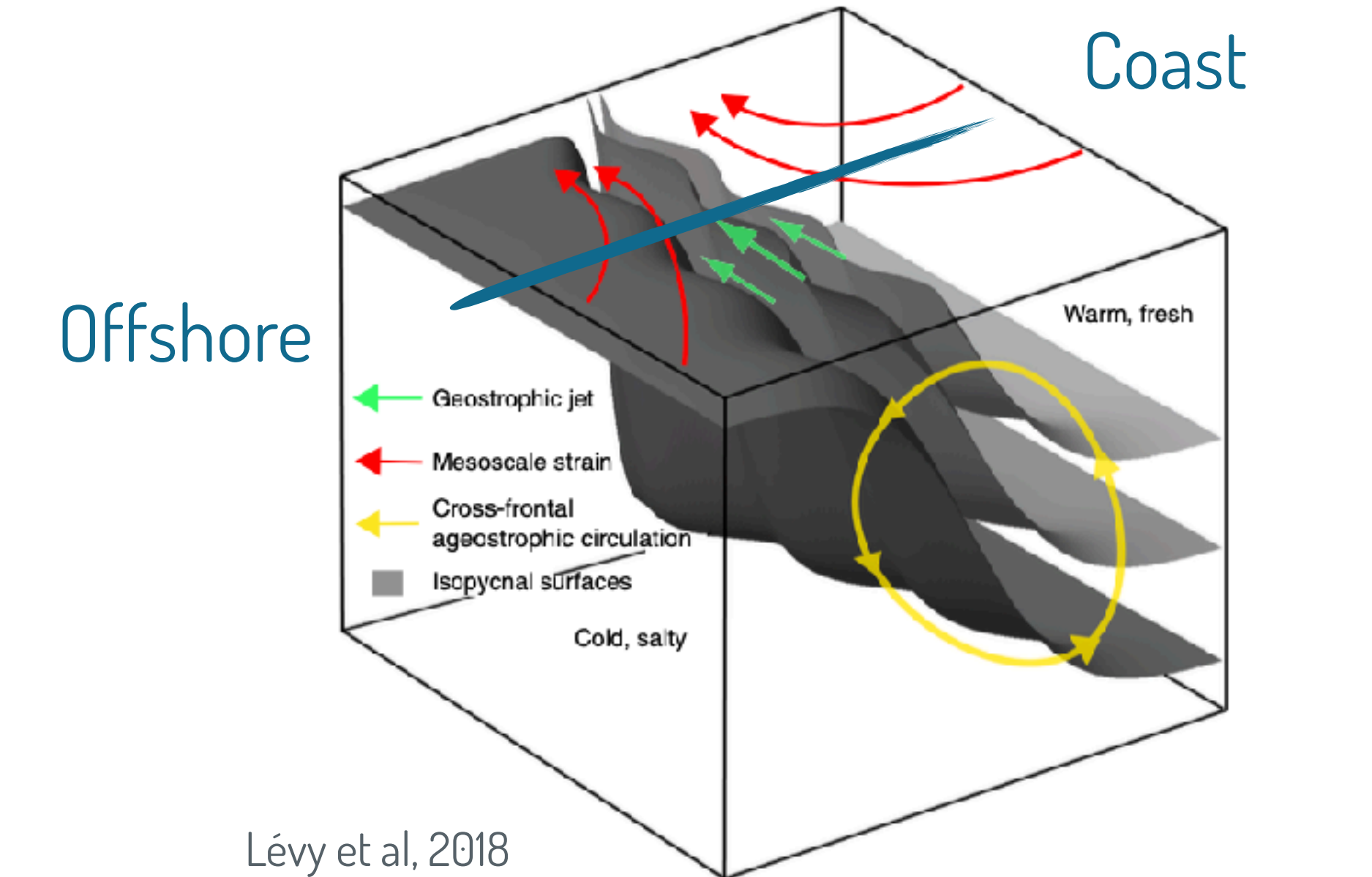
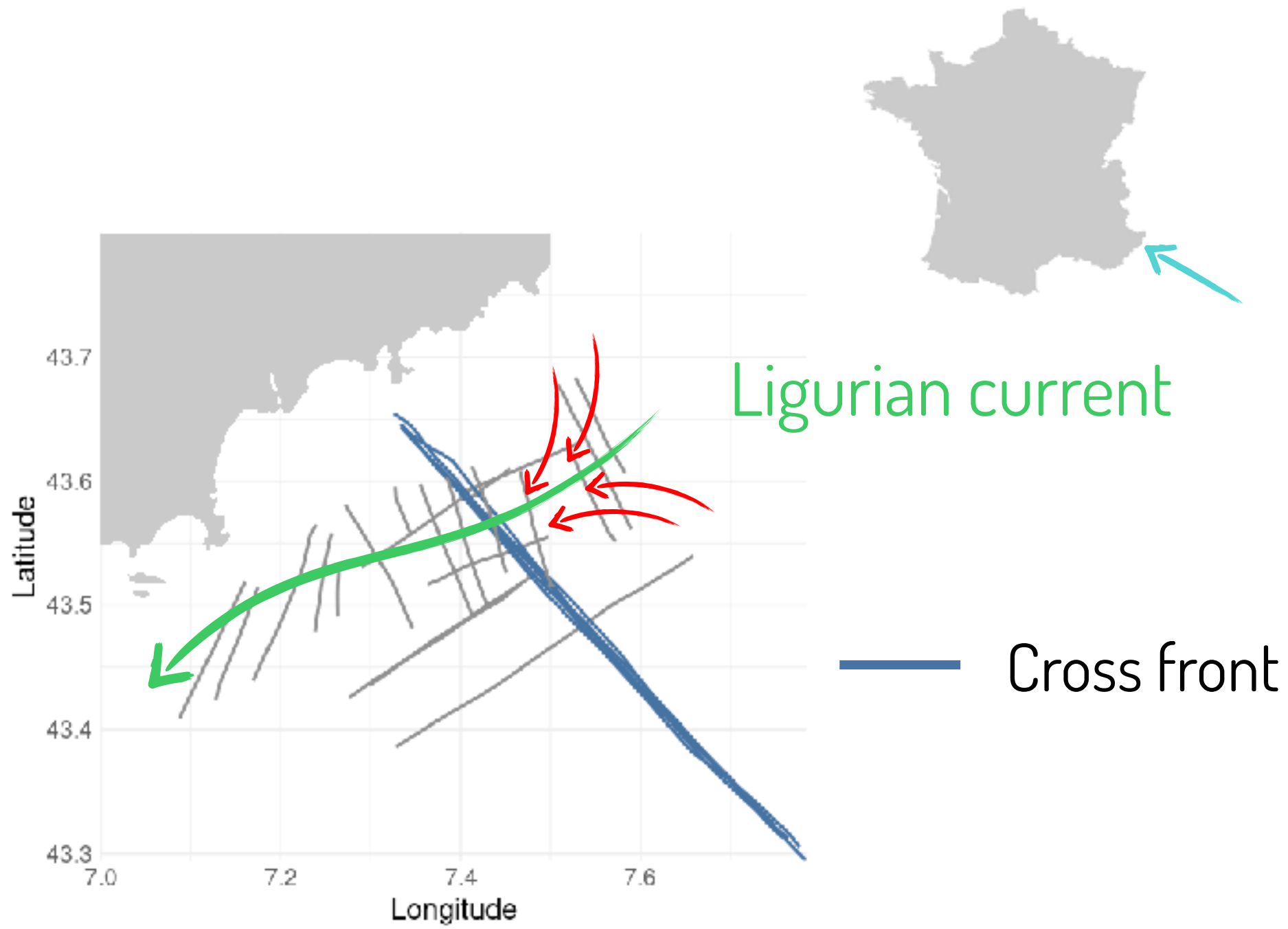
1 mm

Acantharia



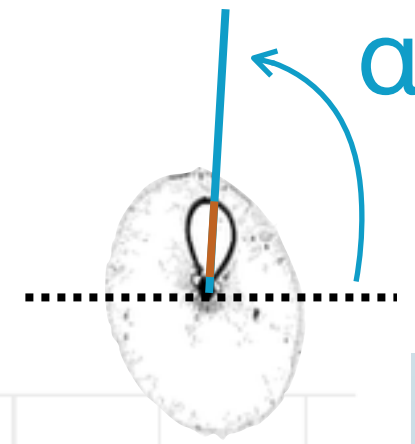
1 mm

Phaeodaria

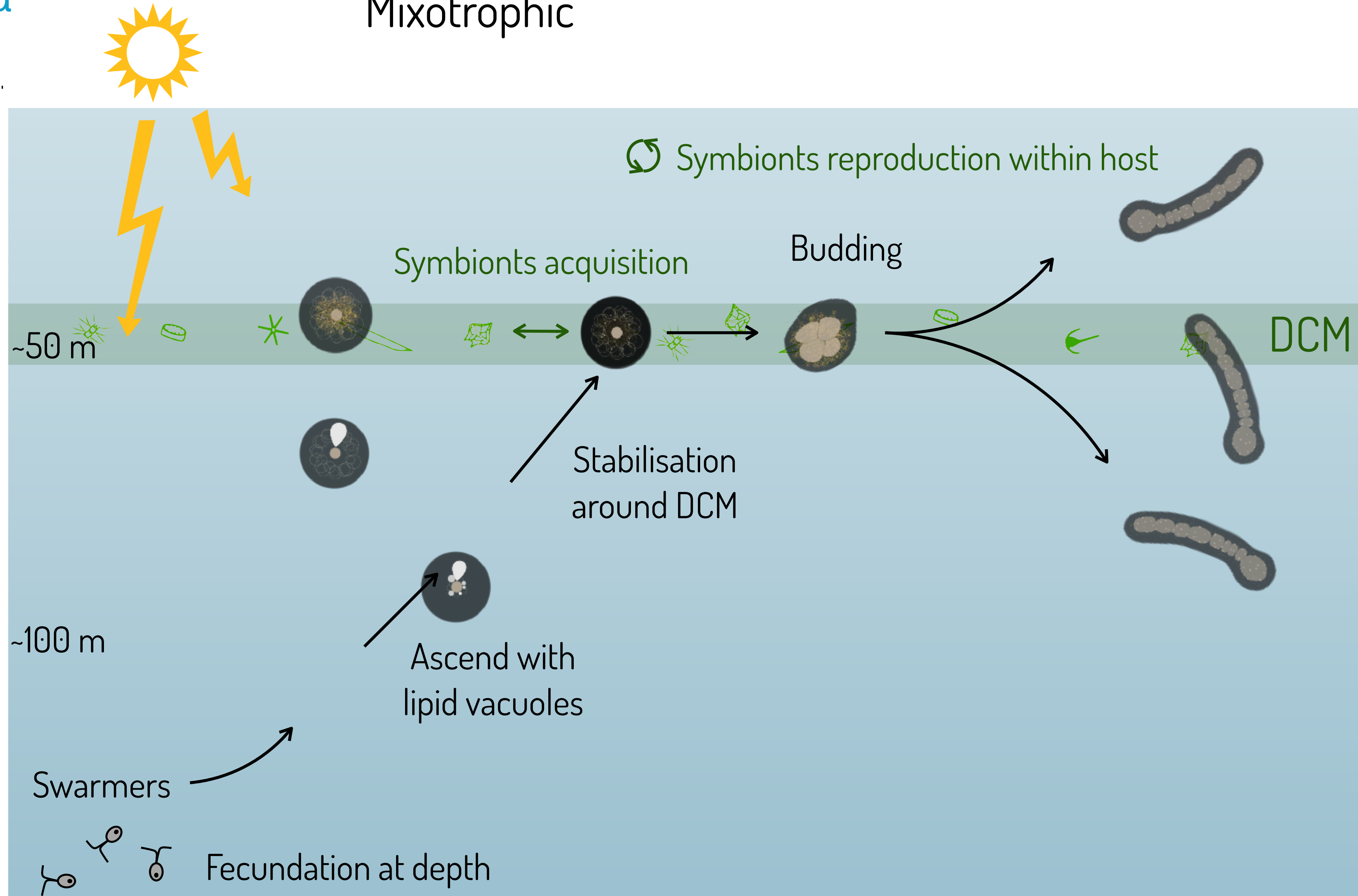
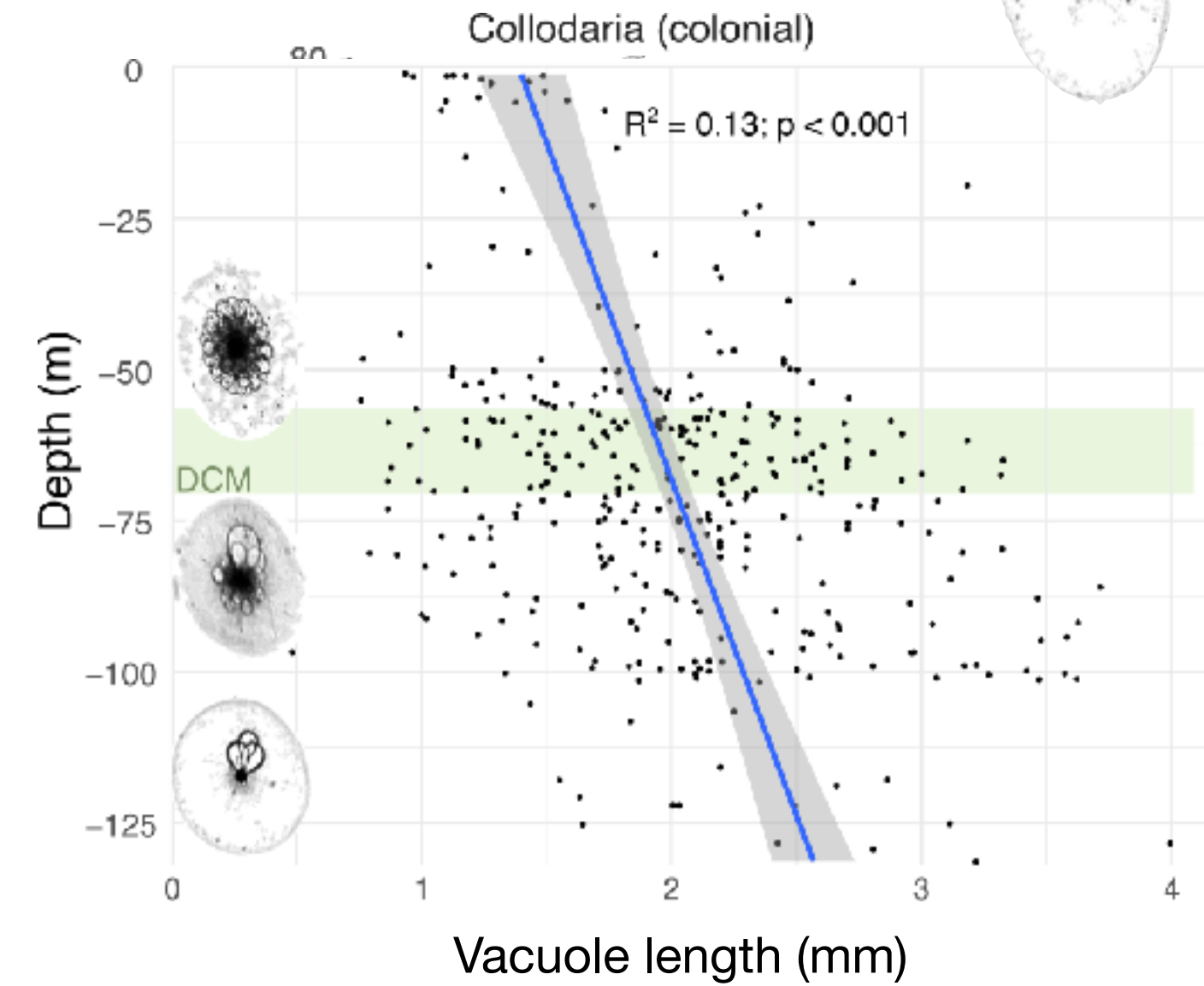


↙ Cross frontal circulation

# COLLODARIA



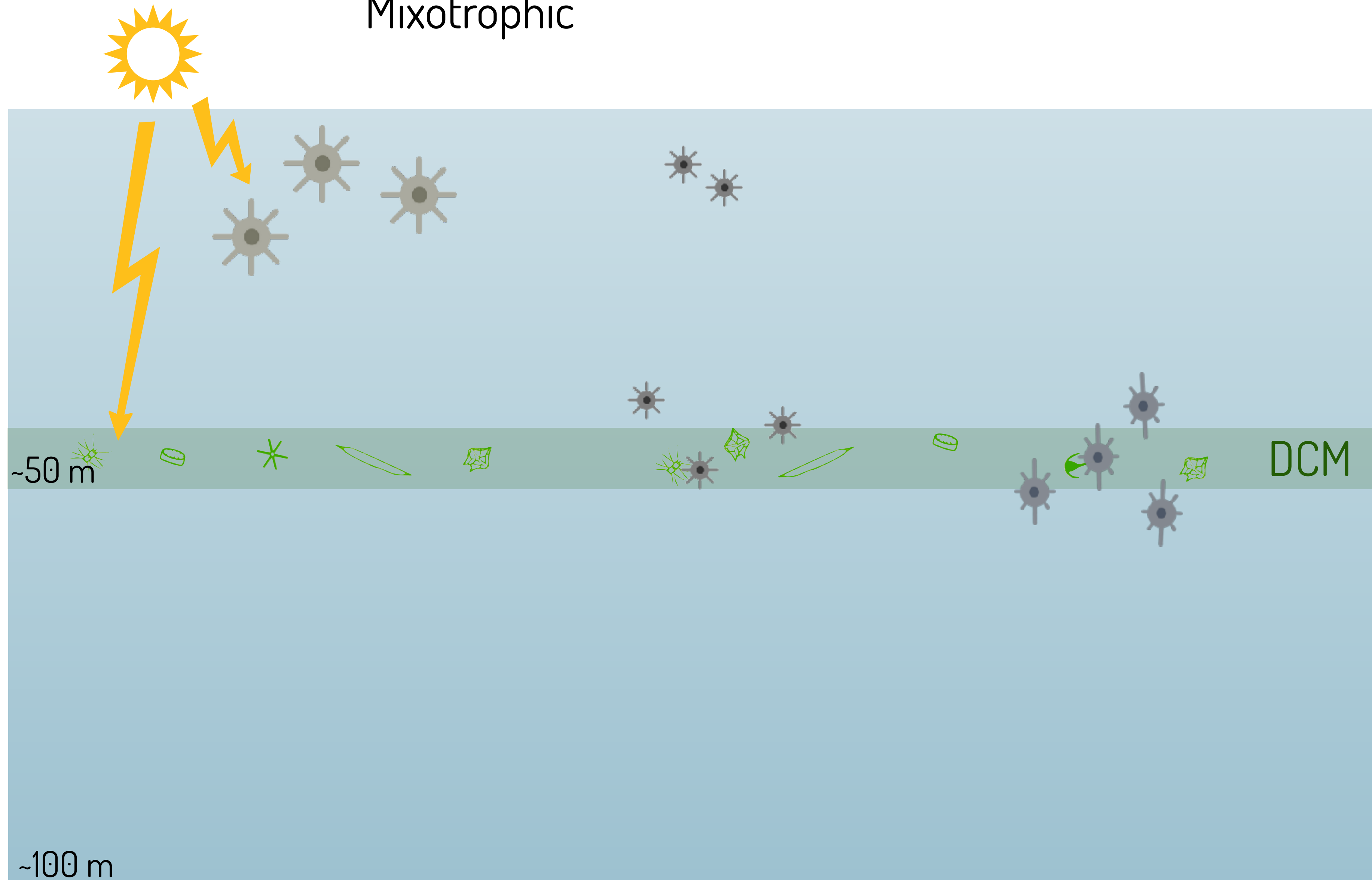
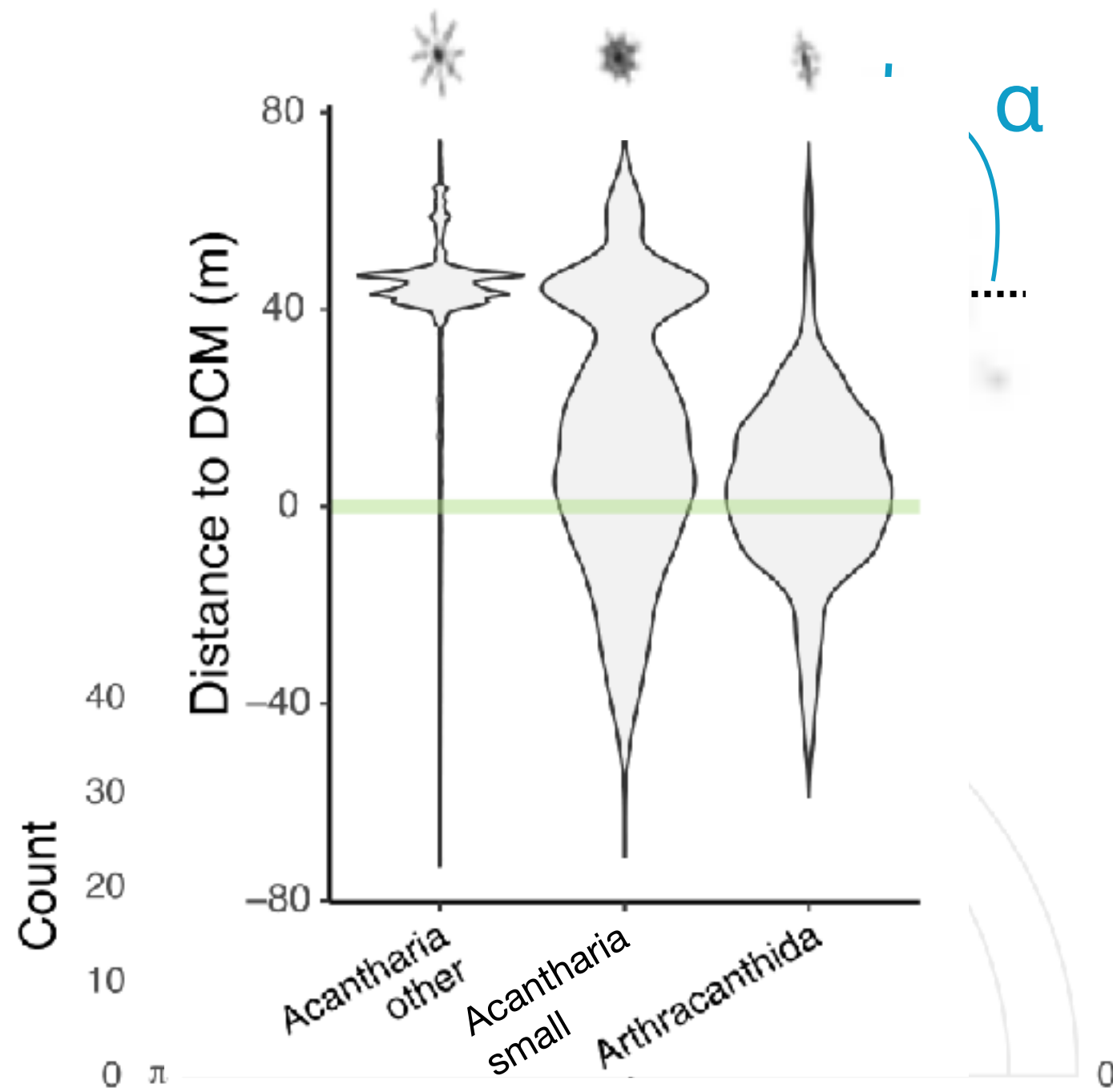
## Mixotrophic



- Active positioning to acquire symbionts
- Different exploitation of the water column by different forms

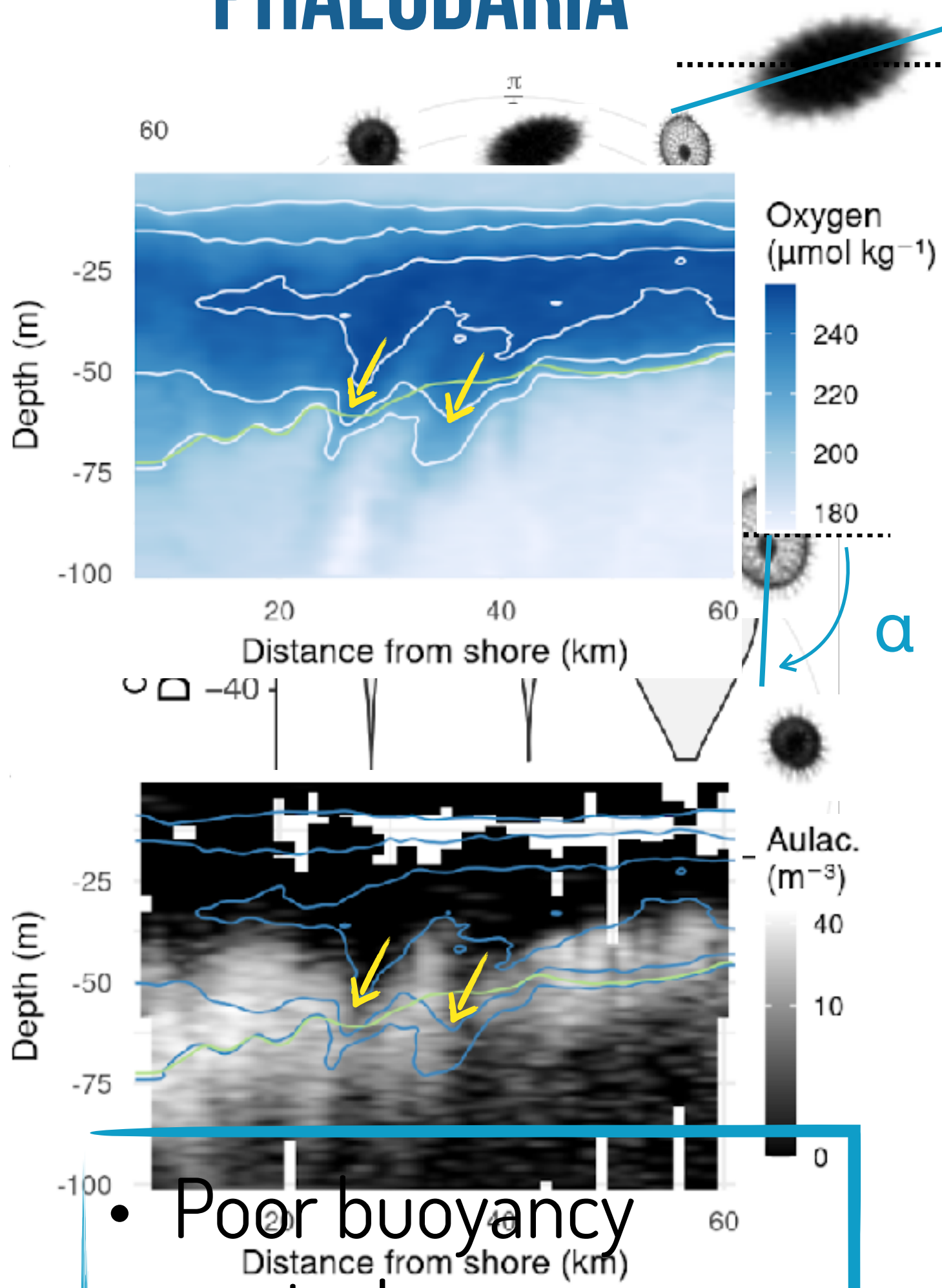
# ACANTHARIA

Mixotrophic



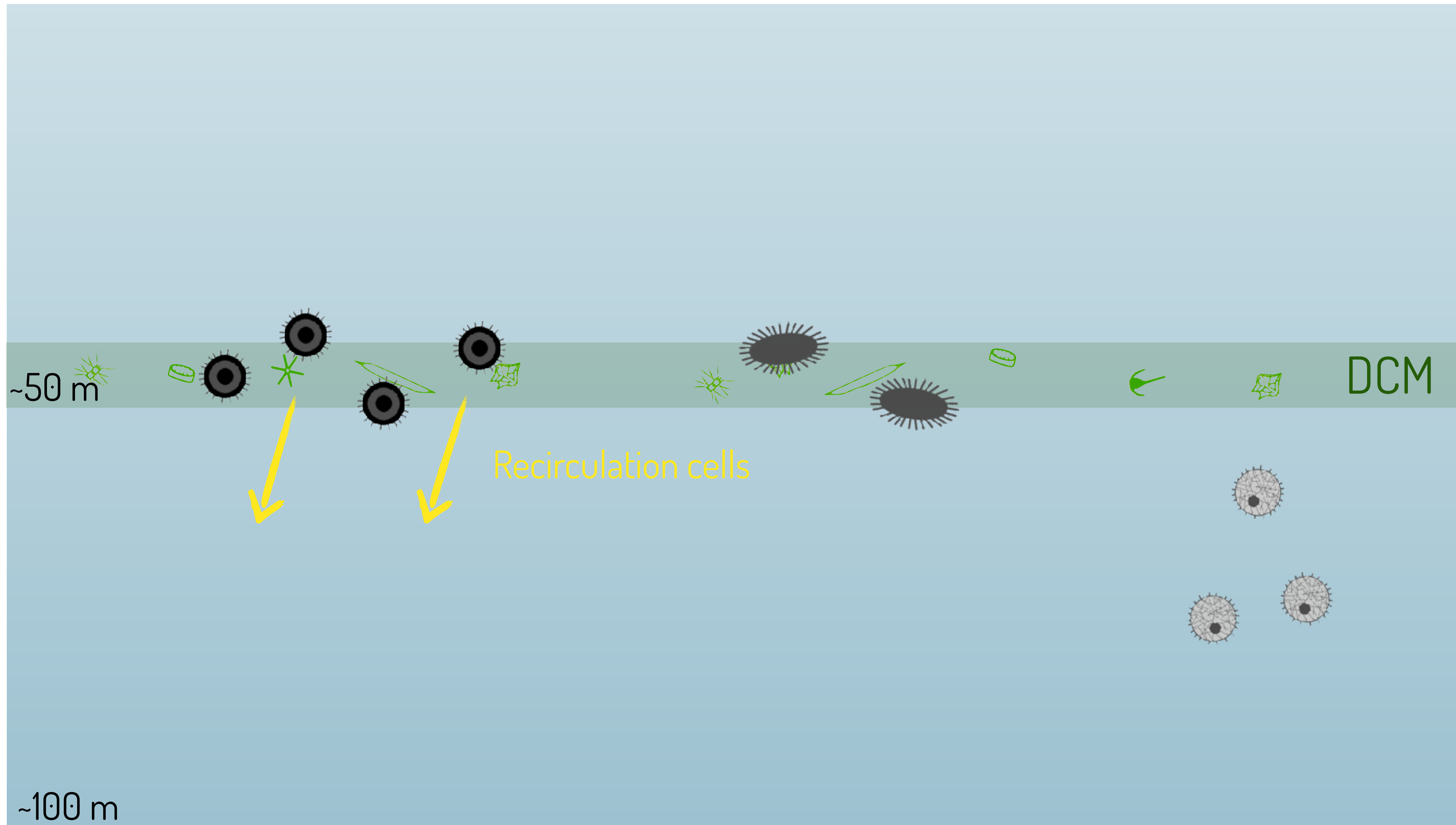
- Different symbionts for different niches
- Active positioning

# PHAEODARIA



- Poor buoyancy control
- Passive orientation

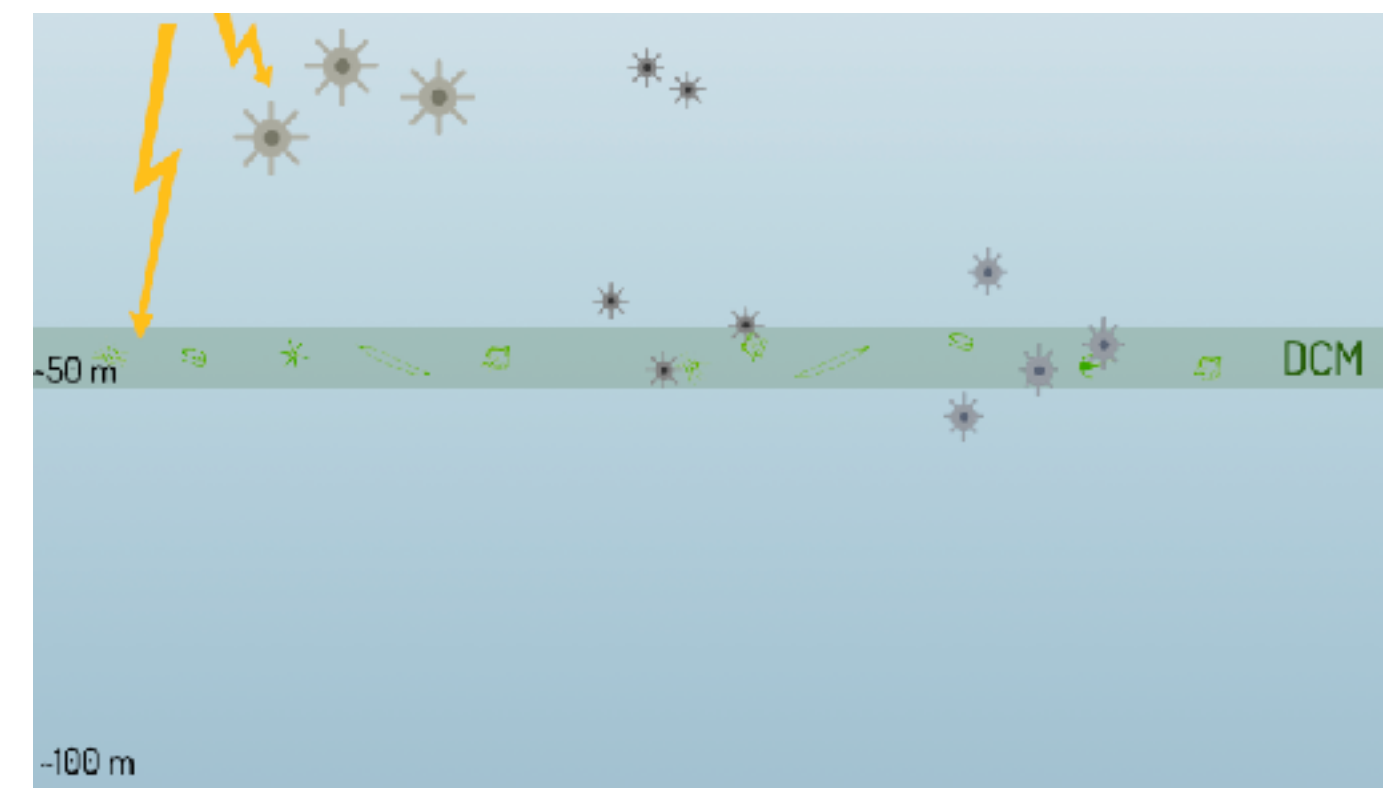
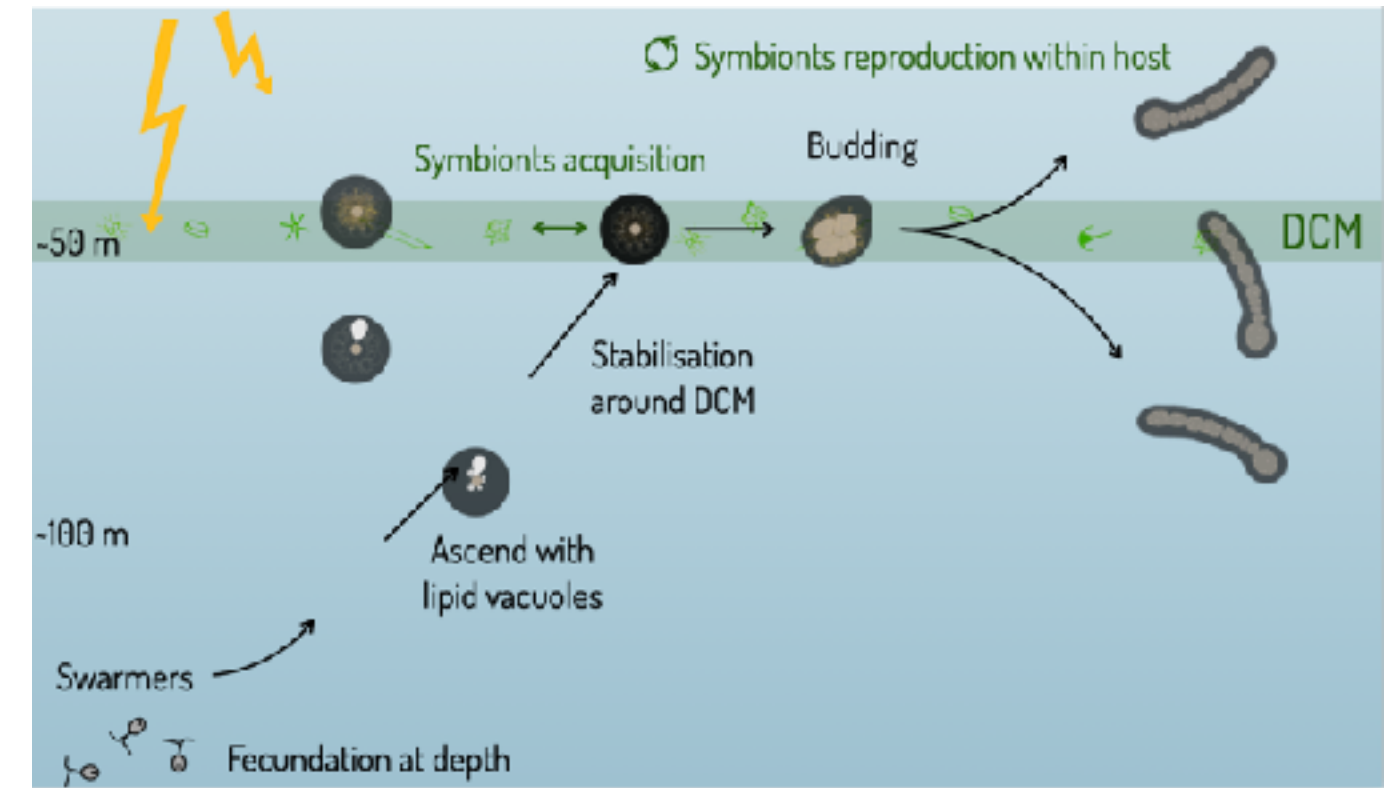
Non mixotrophic





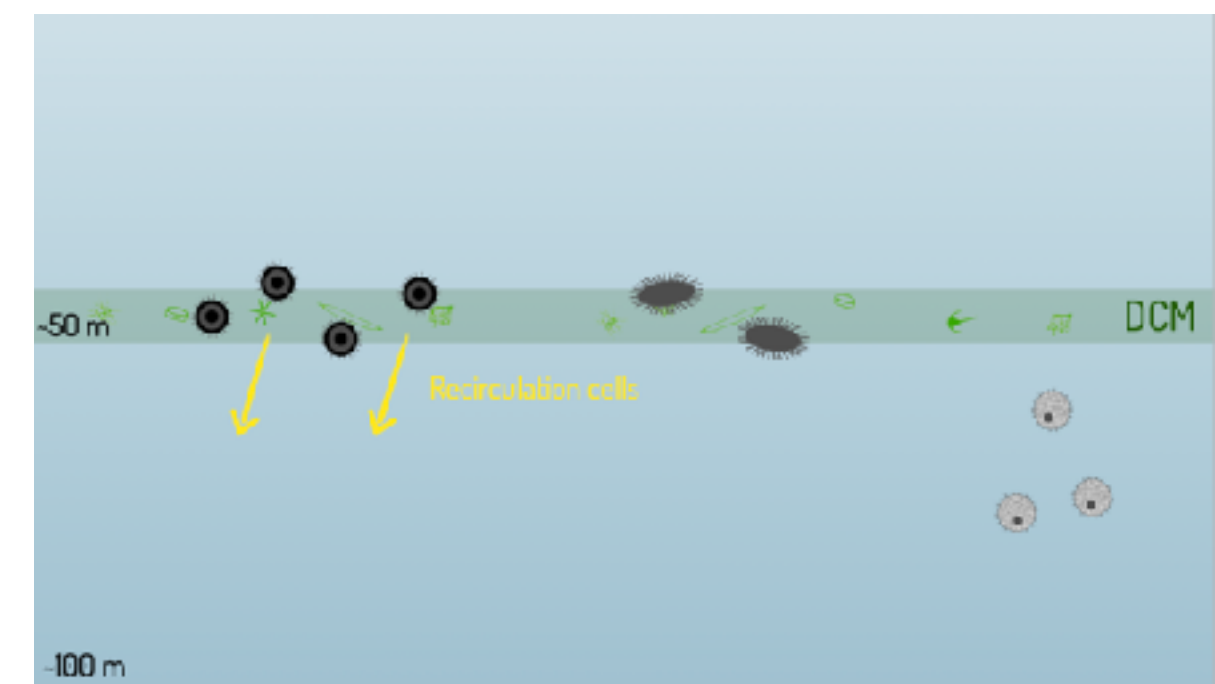
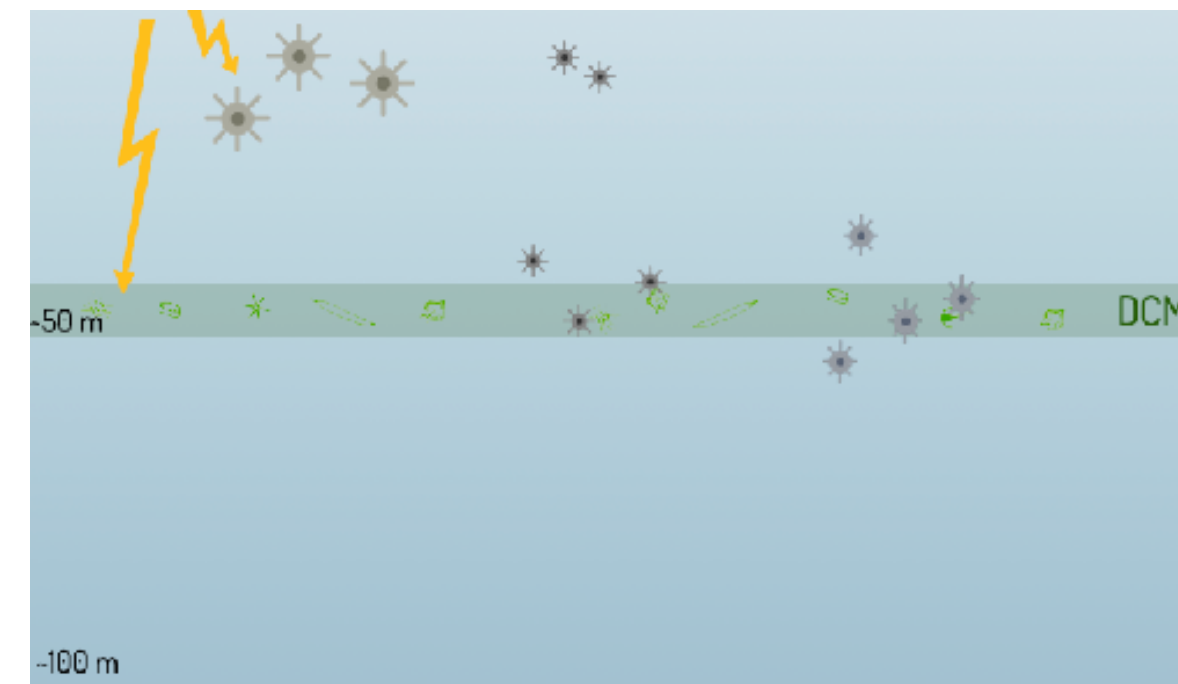
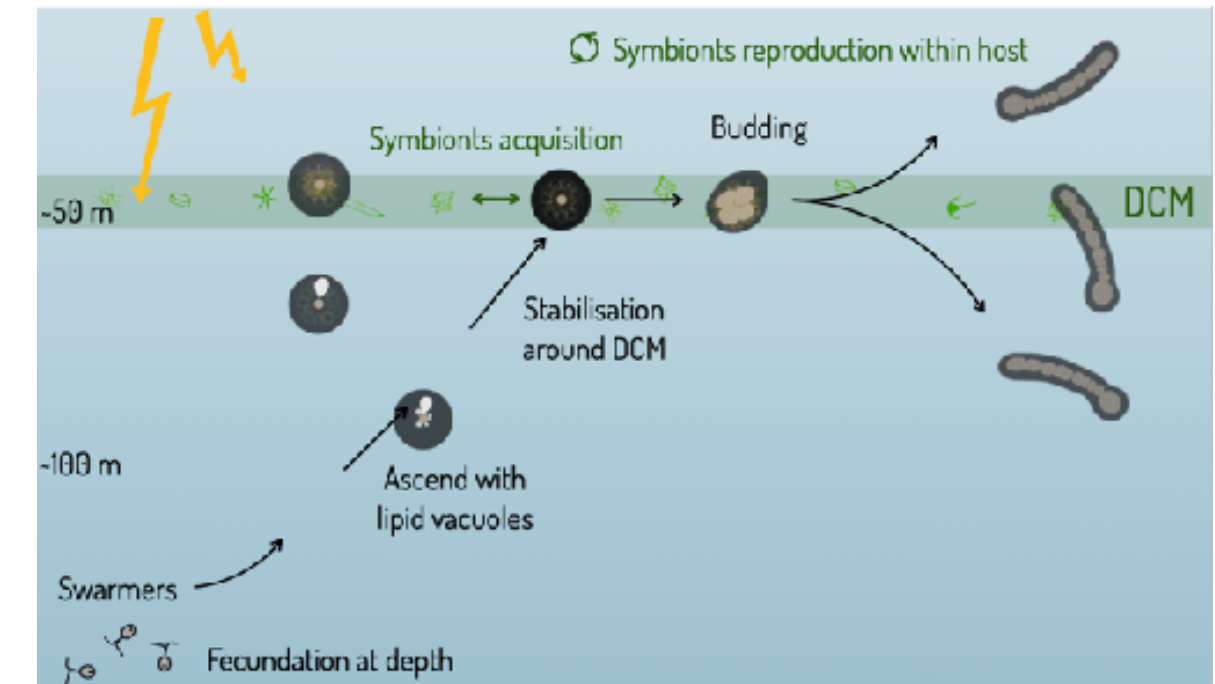
# MIXOTROPHY AND FINE-SCALE DISTRIBUTION

- Differential exploitation of the water column between solitary and colonial Collodaria
- Different symbionts allow the occupation of different niches (Collodaria VS Acantharia)



## POSITION CONTROL WITHIN THE WATER COLUMN

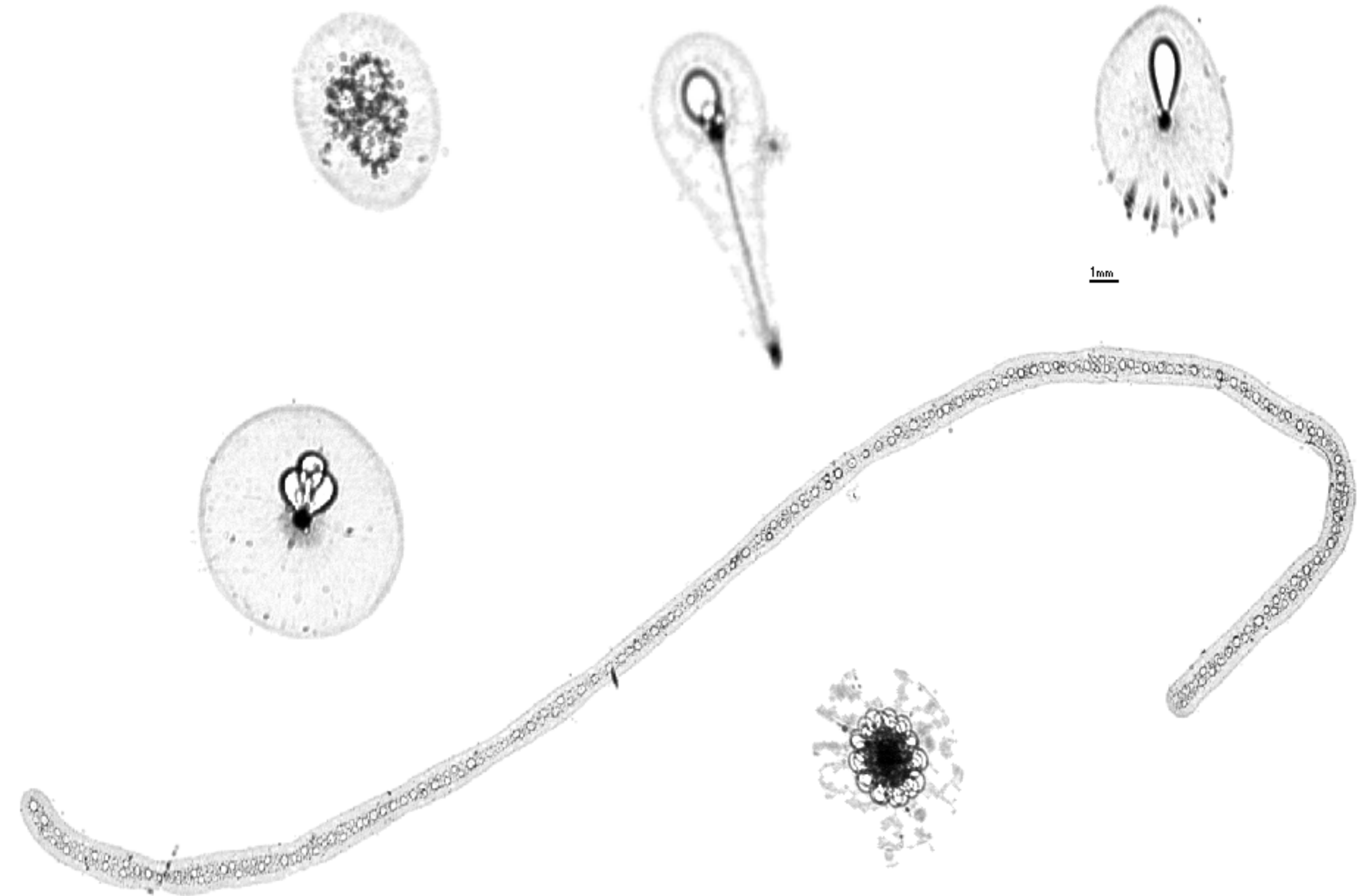
- Active positioning control for mixotrophic Rhizaria
- Collodaria: symbiont acquisition & DCM
- Acantharia: vertical orientation & DCM
- Lack of control for Phaeodaria



In situ imagery to understand protist ecology

Many open questions regarding Collodaria

- early offspring stages, fluorescence in situ
- other seasons



# THANKS

- co-authors
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